

In the Title:

Please amend the title as follows: DYNAMIC COMPUTATION OF A LINE SEGMENT ARRANGEMENT USING FINITE PRECISION ARITHMETIC FOR USE IN [APROCESSOR]--A PROCESSOR-- CONTROLLED SYSTEM

In the Claims:

1. (Twice Amended) For a processor-controlled system capable of operating on and displaying arrangements of line segments in a plane, a method for dynamically producing an output partition data structure representing said arrangement of line segments, said output partition data structure induced by an input unrounded line segment; the input unrounded line segment being represented by a set of real coordinates in the plane; the output partition data structure indicating an output rounded line segment representing the input line segment by a set of finite precision coordinates; the method comprising:[.]

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receiving data indicating the an input unrounded line segment and a signal to insert the unrounded input line segment into an input partition data structure indicating a first partition of the plane;

accessing the input partition data structure; the input partition data structure including data indicating a prior set of unrounded line segments; the prior set of unrounded line segments including a boundary set of unrounded line segments forming a rectangular boundary lying on the plane; locations in the input partition data structure being capable of being specified with reference to a finite precision grid of tiles superimposed on the plane; each tile having a position included therein referred to as

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an integral point having finite precision coordinates; the input unrounded line segment having real coordinates specifying a position within the rectangular boundary;

determining a plurality of tiles in the finite precision grid related to the input unrounded line segment using the prior set of unrounded line segments; the plurality of tiles in the finite precision grid related to the input unrounded line segment being hereafter referred to as a plurality of

related hot pixels; each related hot pixel including an endpoint of the input unrounded line segment or at least one point on an unrounded line segment included in the input partition data structure;

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for each related hot pixel, performing a rounding operation using the input unrounded line segment; the rounding operation replacing real coordinates of a nonintegral point on an unrounded line segment located within the boundary of the related hot pixel with the finite precision coordinates of the integral point of the related hot pixel; the rounding operation causing an unrounded line segment to be split into two fragment line segments, each referred to individually as a fragment and collectively as a polysegment, having a vertex at the integral point in the related hot pixel; each fragment produced by the rounding operation being referred to as belonging to the unrounded line segment from which it was produced;

adding the fragments of the polysegment to the input partition data structure to produce an updated output partition data structure; [and]



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storing the input unrounded line segment in the output partition data structure; the input unrounded line segment being associated in the output partition data structure with all of the fragments belonging to the unrounded line segment from which it was produced; and

displaying an arrangement of line segments using said output partition data structure.

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13. (Twice Amended) An article of manufacture for use by a processor-controlled system capable of operating on and displaying arrangements of line segments in a plane, the system including input signal circuitry for receiving input signals; storage medium access circuitry for accessing a medium that stores data; a memory device for storing a partition data structure representing an arrangement of line segments in a plane; and a processor connected for receiving the input signals from the input signal circuitry, connected for accessing the partition data structure stored in the memory device, and connected for receiving data from the storage medium access circuitry; the article comprising:

a data storage medium that can be accessed by the storage medium access circuitry when the article is used by the machine; and

data stored in the data storage medium so that the storage medium access circuitry can provide the stored data to the processor when the article is used by the machine; the stored data comprising instruction data indicating instructions the processor can execute, said instruction data including instructions for:

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receiving data from the input signal circuitry indicating an input unrounded line segment and a signal to insert the unrounded input line segment into a partition data structure indicating a first partition of the plane; the input unrounded line segment being represented by a set of real coordinates in the plane;

accessing the partition data structure; the partition data structure including data indicating a prior set of unrounded line segments including a boundary set of unrounded line segments forming a rectangular boundary lying on the plane; locations in the partition data structure being capable of being specified with reference to a finite precision grid of tiles superimposed on the plane; each tile having a position included therein referred to as an integral point having finite precision coordinates; the set of real coordinates of the input unrounded line segment specifying a position within the rectangular boundary;

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determining a plurality of tiles in the finite precision grid related to the input unrounded line segment using the prior set of unrounded line segments; the plurality of tiles in the finite precision grid related to the input unrounded line segment being hereafter referred to as a plurality of related hot pixels; each related hot pixel including an endpoint of the input unrounded line segment or at least one point on an unrounded line segment included in the partition data structure;

performing, for each related hot pixel, a rounding operation using the input unrounded line segment; the rounding operation replacing real coordinates of a nonintegral point on an unrounded line segment located within the boundary of

the related hot pixel with the finite precision coordinates of the integral point of the related hot pixel; the rounding operation causing an unrounded line segment to be split into two fragment line segments, each referred to individually as a fragment and collectively as a polysegment, having a vertex at the integral point in the related hot pixel; each fragment produced by the rounding operation being referred to as belonging to the unrounded line segment from which it was produced;

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adding the fragments of the polysegment to the partition data structure to produce a modified partition data structure;

storing the input unrounded line segment in the modified partition data structure; the input unrounded line segment being associated in the modified partition data structure with all of the fragments belonging to the unrounded line segment from which it was produced; and

displaying an arrangement of line segments using said modified partition data structure.